MATCH FRAMING SYSTEM

BACKGROUND OF THE INVENTION

FIELD OF INVENTION

This invention relates to an assembly of components to be used in a structure primarily for the purpose of resisting loads.

DESCRIPTION OF PRIOR ART

The present-day construction of single and multi-story light gage construction of light gage, cold rolled structural steel predominates upon placement of individual studs lined up at specified intervals. These studs are placed at each floor level with a diaphragm placed on top for structural rigidity. Upon completion of the first level studs and diaphragm, the second level stud assembly is placed on top following the same construction dictates as the first level. This type of construction continues up each floor level.

When concrete is poured as a floor diaphragm, the concrete must be allowed

to sufficiently harden before the next level is placed. Due to the uncertainties of the weather this process extends the construction time and permits uncertainties into the construction process.

Present building methods also require strap bracing to resist lateral forces and to help stabilize each level of construction. In present light gage steel construction, these straps have a tendency to bubble out due to the compression deflection on the light gage stud system. This phenomenon seriously reduces the capacity of the strap and unless a field solution is derived could result in collapse of the structure.

Present building methods for light gage steel multi-story require five to six inches of concrete per floor. The dead load placed on the structural directly relates to the horizontal force resulting from earthquake type loadings. In multi-story motel construction the dead load from use of the concrete slab thicknesses noted above far exceeds the live load that building codes permit for non-assembly rooms.

U.S. Patent 3,304,675 which issued February 21, 1967 to E. Graham Wood et al discloses a system suitable for a two story structures with use of prefabricated components. U.S. Patent 3,429,029 which issued February 25, 1969 to E.D. Perry et al discloses a framing system of performed columns and beams.

U.S. Patent 3,942,291 which issued March 9, 1976 to Hirata et al discloses a 3-dimensional space frame. U.S. Patent No. 3,979,868 which issued September14, 1976 to Hambro Structural Systems, Ltd. disclosed a composite deck filled with concrete. This system uses the floor by floor approach and five to six inches of concrete. U.S. Patent No. 5,638,651 by Vern M. Ford issued on June 17,1997 discloses a panelized exterior skin consisting of a membrane. U.S.

Patent No. 5,577,353 which issued November 26, 1996 to William G. Simpson discloses a frame system of steel members coupled together by connecting plates.

SUMMARY OF THE INVENTION

The Match Framing System invention teaches that an assembly of components being comprised of singular and similar unique members and assemblies consisting of singular and similar unique shapes can be utilized in a multiplicity of configurations. The Match Framing System invention teaches that beams may be placed through the girders. The Match Framing System invention teaches that longitudinal load bearing wall assemblies may extend the entire height of the structural wall and provide structural resistance for horizontal loads placed parallel to the assembly frame. The Match Framing System invention teaches that in addition to resisting loads parallel to the frame alignment that these assemblies in conjuction with transverse assemblies and pieces resist loads in the direction perpendicular to the wall assemblies. The Match Framing System invention teaches that the assemblies provide efficient utilization of light gage steel. The Match Framing System invention teaches that assembly connections in conjuction with the art stated above are integral with the assembly and provide continuity for distribution of loads. The Match Framing System invention teaches that the structure design concept can be juxtaposed with the total process of building construction. The result of the above stated art accrues the following primary benefits:

1.) Increases building safety and structural building quality.

2.) Reduces overall cost associated with construction.

3.) Decreases steel and concrete material utilization.

4.) Reduces erection time and difficulty.

5.) Benefits environment.

6.) Lessons risk to field personnel.

7.) Decreases complexity of component assembly.

8.) Provides quicker delivery for building components.

9.) Increase structural strength and reliability of structural components for various loading conditions.

10.) Provides construction less sensitive to weather.

11.) Reduces overall work requirements for the various groups involved in the construction process.

12.) Provides greater overall variations in building interior design for initial construction and future changes.

13.) Provides a structure which offers increase structural reliability during earthquakes and atmospheric induced storms. Overall inherent structural and erection system safety would lesson the risk to human life and injury as compared to present state of art constructions.

14.) Reduces floor heights by placing beams within girders.

15.) Provides exact placement of floor beams.

An object of this invention is to provide factory control over fabrication of girder perforations. The main assemblies are fabricated at either a workshop where quality control can be easily monitored or in the field. The assemblies are of similar fabrication.

The invention utilizes both hot rolled and light gage steel columns. With the use of light gage steel members, shop fabrication of frame girder perforations are relatively quick when compared to hot rolled steel fabrication. Most light gage steel pieces are cut to length by the steel piece supplier, thus saving in this step production time as compared to that of a typical hot rolled fabrication cutting process. Welding light gage steel assemblages is also a relatively quick process when compared to the time taken in hot rolled weldments. Additionally, most

light gage material arrives at the fabrication shop with a material covering placed by the steel piece supplier, thus again saving time to the time spent in a typical hot rolled fabrication painting process.

The assemblies may also be fabricated as generic building assemblies and shipped upon an order for a match structure. The match structure provides for a multiplicity of interior configurations utilizing either the same or similar generic assemblies.

An overall object of this invention is to provide a cost effective structure which has both superior structural reliability and load resistance to that used in present day construction . This invention provides structural redundancies in cases of local structural failures. Loads will distribute throughout the structural framework as a result of the structural continuity of the "Match" design. The invention has a reserve ability to resist high lateral and earthquake loadings due to the stiffness of the assembly frames and the structural coupling, if necessary, with occasional mainly strap or tube braces. Bolts are utilized for most frame assemblies providing increased quality through the rigid construction bolts permit. The invention utilizes lower gage steel thicknesses, than that of typical light gage construction, providing a more efficient path of load resistance and decreasing column vertical deflection, thereby, utilizing a more efficient use of bracing. This invention provides for the use of steel longitudinal roof bracing utilized for both roof diaphragm action and vertical load distribution to adjacent assemblies.

This invention mainly utilizes a one and half to a four inch thick concrete deck, thus reducing structure dead loads when compared to that of the existing art light gage stud, steel composite deck construction.

This invention utilizes a plywood, metal deck and concrete floor systems. The plywood floor system is both cost effective and lightweight. A gypcrete covering may be applied over the plywood. The concrete floor system typically utilizes a three inch concrete slab placed over metal deck. The metal deck may be indented to a structurally interact to provided a composite system with the concrete. The composite metal deck may be placed in manner to be supported

directly by the frames provided in the "Match" system. Typically, when the composite metal deck is supported by floor beams the amount of concrete utilized is reduced substantially over present state of the art composite metal deck light gage structures.

Another overall object of this invention provides that the construction of the exterior frame may be completed before the interior work is performed. Structures in cold climates will have a longer construction season to that which present comparable construction methods provide.

A significant advantage of this invention is that it provides a multiplicity of interior configurations from use of the same assemblies. These interior configurations may be mixed and match in each structure.

A further benefit of this construction is that trade union participation becomes less difficult for light gage steel construction. Present construction methods of bearing walls may require various union trades at the various floor levels of the structure depending on the gage of steel member used. This invention separates the lighter gage non-loading walls from the heavier gage frame assemblies and pieces.

Another benefit of this invention is that structure is less dependent on the quality of levelness of the concrete foundation slab. Shims may be utilized to balance the assemblies with the floor level for assembly erection.

A particular note is that this invention encourages the use of all steel construction providing the public with a safer structure with usage of materials that are non-combustible and benefiting the owner and public with usage of materials that are inedible to insects.

A further note is that this invention utilizes the similar foundation layout currently being constructed for wood framed structures of this type, thereby, providing similar structural detailing when changing from wood design construction to steel design construction.

An additional note of this invention is that less factory fabrication of assemblies and pieces are required that offered by most present panelization

designs. Shipment of the assemblies and pieces are less expensive than current panelization practices due to the ability of this invention to overlap assembly pieces for shipment. This overlap is the result of the placement in the field of most wall girts in the vertical direction.

A further note is that this invention balances the column uplift load requirements for a two or more story building with the total dead load of the overall building system.

A particular note is that this invention offers is that four to five story construction may be easier and more cost effectively built when compared to existing light gage or hot rolled steel state of the art methods.

A further note is that this invention reduces the column wind uplift load requirements for a two or more story building. The column wind uplift load is usually balanced by the total dead load of the floor and wall system by utilization of an effective bracing arrangement. Steel strap or tube bracing typically utilized in light gage construction may be positioned with the "Match" system frame leg locations. This arrangement allows for fewer bracing locations within the structure.

Another further note is that this invention provides a structure that may be removed and relocated to other locations. A wood product diaphragm deck is used if future building plans call for relocation.

An additional note is that the structure provides cost effective solutions to high wind load areas and areas with high seismic possibilities.

A further note is that the structure could be combined easily with exterior wall materials. These materials could be placed in a factory and shipped to the site and erected as one unit with the frame system. These wall materials could be designed as a foundation wall system. This foundation wall system could be utilized within a basement of the structure with an overall specialized design providing shelter against high winds and tornado type loadings.

Another note is the system provides additional opportunities due to the simplicity of the "Match" system frame standard design. The commonality of

shop fabrication detail encourages mass production of the frame units and therefore providing respective cost savings and thereby increasing the overall the fabrication start to finish speed of delivery to the building site.

A particular note is that the frames provide both a raw fabricated piece and a finished product. As a raw fabricated piece, the frames could be easily reinforced to the desired structural capacity required for the finished building product or erection method utilized through use of additional material typically screwed or welded in the field. The frames may be utilized solely without additional reinforcing if load requirements have been met for all standard "Match" frames.

A further note is that the "Match" system frames typically utilizing light gage steel material are substantially lighter than fabricated hot rolled or precast concrete "Match" frame assemblies. The standard "Match" system are typically designed to stack both efficiently and easily. A typical project usually requires only one or two truck shipments from the fabrication shop to a building site.

Another particular note is that the system does not necessary utilize prefabricated trusses. A stick type roof system is easily erected. The structural floor and wall system is basically structurally independent from the roof system. With additional working platforms utilized also for roof stability the roof system is safely erected with spacing of the roof joist matching the legs of the frames.

An additional note is that the "Matched" system is versatile and easily altered in the field for adjustments due to possible improper placement of foundation slab and utilities when compared to an hot rolled steel structure.

A further particular note is that the speed of erection of the "Matched" system could be substantially less over all other types of present state of art constructions.

BRIEF DESCRIPTION OF THE DRAWINGS

While the specification conclude with claims particularly pointed out and distinctly claiming the subject matter recorded as forming the present invention,

it is believed the invention will be better understood but not limited to the following description taken in connection with the accompanying drawings in which:

Fig. 1 shows elevation views of the typical frame assembly utilized in combination frame assembly or end wall condition.

Fig. 2 shows elevation views of the typical frame utilized in a singular frame assembly.

Fig. 3 shows elevation views of the typical frame utilized in a multiple frame assembly.

Fig. 4 shows an elevation view of two typical frames utilized in a combination frame assembly.

Fig. 5 shows an elevation view of two typical frames utilized in a combination frame assembly supported by a foundation base.

Fig. 6 shows an elevation view of two typical combination frames utilized in an assembly with the combination frames separated by an infill member with the total assembly supported by a foundation base.

Fig. 7 shows an isometric view of a typical wall assembly comprised of frames and a post with a variety of members attached to the overall frame and post assembly.

Fig. 8 shows an elevation view of part of a typical wall and adjacent floor assemblies with girders perforated and rotated to attach through girder beams.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing in which, identical or nearly identical features are designated by the same designation, Fig. 1, Fig. 2 and Fig. 3 shows elevation views of the typical frame assembly utilized in a combination frame assembly or an end wall condition with frame leg **1** providing for the frame assembly vertical and lateral support with frame leg **2** to the frame. Frame leg

type **2** is typically used for a combination frame assembly, multiple frame assembly or end wall framing condition. Horizontal member **3** ties the two frame legs together and provides support for floor beam members. Additionally, horizontal member **3** provides with vertically-upwardly frame leg **1** and frame leg **2** resistance to lateral loads. Base plate **5** transfers the loads from both frame legs to the base. Base plate **5** is also utilized as a splice plate for vertical positioning and connecting between lower and upper frames if additional building height is required. Mark number **6** provides field identification of frames after field or shop fabrication. For additional structural support, the column legs could utilize high strength bolts. Holes **7** are provided for both high load connections and electrical conduit positioning. Holes **7,** as shown, provides the connection for the roof support assemblies with main roof members typically supported at the leg frames. The frame could also be erected as a singular piece. Frame leg **8** is utilized when a singular frame is required. Additionally, to identify frames alternate mark designation methods may be utilized. Mark designation **9** denotes the possible use of various localized color coatings applied in the field or fabrication shop for identification of frames.

Fig. 4 and Fig. 5 shows an elevation view of two typical frames utilized in a combination frame assembly and a combination frame assembly on a base. Frame legs **10** when properly attached together provide additional capacity than that of the individual capacity of the each leg frame designed separately. Screw **11** and bolt **12** are utilized to attach separate frames legs into the built-up member. The screws are typically self-drilling and easily installed at the field site. Base **13** could be typically poured or placed without the foundation anchor bolts placed prior to the concrete pour. Continuous strip footings may be utilized for a typical foundation system beneath the frame assemblies providing an economical match of material between the foundation and the structure above.

Fig. 6 shows an elevation view of two typical combination frames utilized an assembly with the combination frames separated by an infill member with the total assembly supported by a foundation base with flange cut **14** primarily utilized for attachment of a channel floor beam directly to the web of the built-up

leg frames. Typically, strap bracing, when required, is also located when at this joint. Member **15** provides the typically field placed infill beam between the two combination frames. Member **15** is typically screwed or bolted to the adjacent leg attachment member. Member **15** may rotated in a direction providing a chase for possible plumbing utility piping. Connection **16** typically provides for this continuity of load between the horizontal members. As required for a connection between the combination frame with a roof support assembly, one vertical leg of combination frames may be shorter than the other vertical leg. This positioning as depicted by **17** allows for direct attachment of a typically, channel-like roof assembly member to the web of combination frame longer leg. Erection attachment **18** provides the frame a connector for primarily erection loading. Anchor bolt **19** is typically a field drilled connector which provides for the transfer of loads between the foundation and the structure above. Typically, with strap placement from one frame wall assembly to the adjacent opposite frame wall assembly anchor bolt **19** is utilized mainly to resist the horizontal forces.

Fig. 7 shows an isometric view of a typical wall assembly comprised of frames and a post with a variety of members attached to the overall frame and post assembly. Utilization of these members demonstrates the overall versatility of the "Matched" system and frame assemblies described herein. The frames are typically lightweight and easily shipped and installed. Floor beam **20** is shown rigidly attached to the built-up frame legs. Placement of the floor beams may be located on any location of the frame assemblages horizontal members. Strap **21** consisting of typically a sheet of steel attached to the frame. This member provides resistance mainly to horizontal loads placed on the structure. Other type bracing systems may be easily utilized with the "Matched" system. Strap **22** shows strap bracing placed along the plane of the face of the frames. The frames may be utilized both as a finished produced and a raw material. A top track "C" section **23**, a typical cold rolled type section without lips, provide additional structural resistance to various loads while also veing utilized as a connector for the infill studs **24**. The studs may be place in the fabrication shop or in the field on

ground level or placed after the frame is in the final position. Additionally, veneer coverings **25** could be comprised of various materials and may be utilized for both structural load resistance and architectural effects. The frames are easily reinforced **26** with this reinforcement increasing structural load capacities of the overall field assemblage. As a raw material member, the frames may be utilized in a variety of capacities in the field. The frames are easily adaptable to both shop and field exterior coverings **27** and also such coverings providing both increased structural capacity and enhanced architectural effects. Additionally, poured concrete type of reinforcement **28** provides protection for frames and superior loading capacities. Increased building heights are provided with poured concrete reinforcement of frames. Another element that lends itself to the "Matched" design are typically field constructed post **29.** Typically, post **29** is comprised from several members and is utilized as a column support when a typical frame could not be placed. Additionally, the frames provide support for finished interior walls **30.** Interior walls **30** are typically a sheetrock type product commonly used in present building construction methods. The frames may also be stiffened by exterior sheathing products **31** placed on the ground level or after field frame placement. Wood products may be utilized for the exterior sheathing with proper design detail. Besides floor beams, ceiling joist **32** is easily placed on the frame top horizontal members. Additionally, bar joist **33** may be utilized in lieu of channel-like sections for support of the floor and roof systems.

Fig. **8** shows an elevation view of a typical wall assembly comprised of frame and a column of and adjacent frame with perforated gider **34** extending from column to column of frame and perforated girder **35** extending from frame column to adjacent frame column. Connection **36** shows beam protruding through web of girder with beam attached to rotated lip of girder. Connection **37** shows girder attachment to frame column leg with both screws and bolts being used at various stages of the the erection process. Hat channel and sheetrock ceiling **38** is shown as the ceiling assemblage that extends continuously without interruption beneath girders. Reinforcement 39 is shown on bottom and provides

additional girder capacity to loads. Metal deck and concrete surface **40** shows the flooring system utilized on every floor level. Roof assemblage **41** extends from frame to frame. Bracing system **42** provides stability for the structure.